ROCKS and MINERALS

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Edited and Published by PETER ZODAC

AUGUST 1939

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

Chips from the Quarry

PETER ZODAC

The Editor Is Honored

The Editor of ROCKS AND MINERALS was, in accordance with due notice sent him by Mrs. Lillian M. Otersen, Secretary, "Unanimously elected a life member of the New Haven Mineral Club in recognition of your services to mineralogy."

We are most grateful to the New Haven Mineral Club for this honor bestowed upon us especially as it is conferred in recognition of what we have been endeavoring to accomplish in the last 12 years—a reawakening and preservation of an awakened interest in the collection and study of minerals. This life membership comes as a stimulation to a life labor for the editor in publishing an increasingly interesting magazine, and the creation of an Association which we hope may one day be large enough to hold an International Convention.

Mineral Day at World's Fair

There is no general exhibit of the world's minerals in New York City's stupendous and interesting World's Fair. But some of the foreign nations and several of our states, whose mineral wealth is outstanding, are displaying fine collections of the minerals for which they are specially noted.

Some of these exhibits, especially those of gems, are worth millions of dollars. They are, however, difficult for the casual visitor to find for there is no printed guide to them. So far as mineralogists are concerned, they have been left to take their chances. But Mr. Joseph D'Agostino, the efficient Secretary of the Plainfield Mineralogical Society and Exhibit Manager for the RCA World's Fair Exhibit, is making it possible for all mineralogists to have their day at the Fair. He has interviewed Dr. Gerald Wendt, the Fair's Director of Science and Education, and persuaded him that the exhibits of minerals should be made available to those specially interested in them, and the result of Mr. D'Agostino's efforts has been that Saturday, Aug. 19th, has been specifically made the Fair's "Mineral Day".

Mr. D'Agostino, who is a member of the Rocks and Minerals Association, has requested us to call attention to this day in our August number, and to extend an invitation to all mineralogists, young or old, amateur or professional, member of a club or nonmember, in short everyone, crazy, sane, mildly interested in minerals or wondering what it is all about to attend the Fair on August 19, and swell the crowd that will tour the buildings having the finest exhibits on display. Full information is given in a page advertisement on the back cover of this magazine. Read it, and plan to attend.

We think we can speak for all mineralogists in expressing to Mr. D'Agostino our very grateful thanks for opening up the Fair to us and making it possible for us to have our day there.

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Whole No. 97

NOTES ON THE LIFE OF PLINY THE ELDER AND HIS MINERALS

By R. M. COLCORD

Despite the many references to a man called "Pliny," there seems to be a vagueness concerning this great Roman and his accomplishments. Much of this confusion is, no doubt, due to the fact that two men, with very similar names, are important enough to be quoted. The encyclopaedia lists one of these men as Gaius Plinius Secundus, or Pliny The Elder, (A.D. 23-79); and Gaius Plinius Caecilius Secundus, or Pliny The Younger, (A.D. 61 or 62-113). The first Plinius, known as Pliny The Elder, is the author of the *Historia Naturalis*; and the second Pliny is famous for his "Letters." Because we are interested in minerals, it is this natural history which is of interest to us. However, it is through the younger Pliny's "Letters" that much information has been conveyed to us concerning the life and works of his uncle, the elder Pliny. The *Historia Naturalis* is the only complete publication of the great author now extant, for of his other writings only a few scattered chapters have been saved.

The nephew has also given us an interesting account of the method used by his uncle to accomplish the prolific writing represented by the history while holding important government positions. Pertaining to the industry and activity of his uncle, the younger man has the following to say: "You will wonder how a man so occupied with business could possibly find time on subjects of a nature so difficult to be treated of . . . . his genius, however, was truly quite incredible, his zeal indefatigable, and his power of application wonderful."

Before proceeding with this review, a word about the translations, of which there are two in English. The first was done by Philemon Holland, published in 1601. The other was made by Dr. John Bostock, M.D.; completed and published by H. T. Riley in 1855. The last translation has been used for this review and is a splendid piece of work. The translators have included, with the translation, the life and writings of the author; translations from Pliny's "Letters"; translations from the French writers, Buffon and Cuvier; quotations from the third edition of Dana's *System of Mineralogy*; references and quotations from *A History of Inventions, Discoveries, and Origins*" by John Beckman, (1739-1811). The latter possessed that rare combination of interests in economics, philology,

and natural history. In cases where Pliny was indefinite, Beckman ran down all possible clues, and it is his findings that are of so much help to us. Beckman does not comment on all the minerals, but one feels that his criticism is reliable. A translation of this history of inventions was published by Bohn in 1846 in two volumes. Fortunately these two volumes were available for this review.

A short resume of the whole *Historia Naturalis* is expressed very concisely in the words of Baron George S. Cuvier, (1769-1832) in his *Biographie Universelle,* (Vol. 35): "Not an account merely, more or less detailed of animals, plants and minerals, but a work which embraces astronomy, physics, geography, agriculture, commerce, medicine, and the fine arts, ... while at the same time he continually interweaves with his narrative information upon the arts which bear relation to man considered metaphysically and the history of nations .... so much indeed, that in many respects this work was the encyclopaedia of its age." George Leclerc Buffon, (1707-1788), another great French naturalist, comments: "This compilation contains matter grouped in a manner so novel, that it is preferable to most of the original works that treat of similar subjects." *(Discours Premier sur l'Histoire Naturelle).*

Pliny's natural history consists of 37 books, five of which treat of minerals and their uses. The last book deals exclusively with those minerals used for precious stones. It is to be regretted that Pliny did not have more time at his disposal for the preparation of his history. There are, in this series of books, a great many statements that are very difficult to understand. These obscure passages are mainly due to incorrectness of his sources of information, lack of detail, or poor translation. In regard to this inaccuracy of translation, Sir John Hill, in *A History of Fossils,* 1748, London, makes an interesting comment. After Sir John had struggled with a passage of the Elder, he made the following observation: "I have had occasion to observe in Pliny so many inaccuracies and careless translation, from Theophrastus, particularly, that I am far from thinking it impossible that he might have originally given us this passage as it now stands .... If we may have leave to undertake all the errors of Pliny in this manner, and be permitted to make him say exactly the contrary to what he does say, we may certainly soon make him one of the best authors in the world." All the critics say that Pliny was too credulous, also that he was too willing to mix fable with truth. In the words of Baron Cuvier: "Despite the faults which we are obliged to admit in him when viewed as a naturalist, we are bound to regard him as one of the most meritorious of Roman writers."

At the end of each book Pliny gives a list of the Roman and foreign authors quoted, but most of these authors are now unknown. Rather than discuss the individual sources of his information, we shall briefly mention some of the writers showing previous knowledge of minerals. In early biblical writings; medical and astrological mineralogies, we find indications of a knowledge of minerals. Of these writers the important ones were Herodotus, Orpheus, Plato, Aristotle and his famous pupil, Theophrastus, who can be called the father of systematic mineralogy. The latter writer was unique for dividing his stones into male and female groups.

Preceding Pliny by only a short period was the Greek, Dioscorides, who added little to the knowledge of mineralogy, but who developed the idea of virtues in precious stones, which idea still lives.

Book XXXIII

The Natural History of Metals

Pliny's Mineralogy

The grouping of his minerals is as follows: Metals, Earths, Stones, and Precious Stones. As you will notice below, the order of the metals is much the same as that of many mineralogists. You will notice too that he will follow up a metal which he has described with some non-metallic substance in order to introduce a relation that he wishes to emphasize. One very helpful thing about his writing is that he usually carries the title of the chapter in the first lines.

Metals

"We are about to speak of metals, of actual wealth, the standard of comparative value . . . In one place, for instance, we undermine for the purpose of obtaining riches. In another place to satisfy the requirements of luxury . . . . to adorn our fingers and the walls of our houses; while in the third place, we gratify our rash propensities by a search for iron, which amid wars and carnage, is deemed more acceptable even than gold." He continues by calling attention to the fact that we penetrate into the earth's vitals as though that ground we walk on "were not sufficiently bounteous and fertile for us!" At the end of this introduction he wonders, "When will be the end of thus exhausting the earth, and to what point will avarice finally penetrate!" He finishes by "how innocent, how happy, how truly delightful even would life be, if we were to desire nothing . . but what is provided ready to our hands!"

Gold

Gold he regards as superior to the other metals because first, it suffers no loss from the action of fire, although he has already said in Book XIX, Chapter 4, that linen made of asbestos "is incombustible"; second, "gold is subject to no rust, verdigris"; third, "no emanations whatever from it, either to alter its quality or to lessen its weight."

"Among us it (gold) is procured in three different ways; the first of which is in the shape of dust, found in running streams. A second mode of obtaining gold is by sinking shafts or seeking it among the debris of mountains . . . . " A very good description of the ancient method of shaft mining will be found in an article by Frederick M. Oldach, in Vol. 2, Sept. '27, of ROCKS AND MINERALS entitled, "The Ancient Silver Mines of Laurium, Greece." "The third method of obtaining gold surpasses the labours of the giants (who heaped mountains on one another) even." In this case a hill was undermined, leaving sufficient columns of the hardest rock to support the mass. When enough material had been removed, the pillars were knocked down and the whole hill was thus broken and shattered. There is quite a similarity in this method to the "block-cave" type of mining in use today.

For the washing of the debris, when possible, a hydraulic method was used very similar to our own with the exception that above the workings a dam was built with gates which were opened wide when the dam became filled. This water rushed over the gold bearing material and was recaptured again in troughs. The latter were lined with "ulex" a prickly and

rough plant similar to rosemary, "well adapted to the arresting of any pieces of gold that might be carried along." The ulex was then "dried and burnt, after which the ashes of it are washed upon a bed of grassy turf." In the chapter on quicksilver he describes the use of skins, "well tawed" to separate the gold from the amalgam. Of this method of separation Beckman says: "The first use of quicksilver" for the above purpose, "is commonly reckoned a Spanish invention, discovered about the middle of the sixteenth century." Since Beckman's time this error seems to have been corrected.

Orpiment and Electrum

Interesting as is Pliny's discussion on the physical properties and uses of gold, we will have to pass on to orpiment. Pliny mentions this mineral here because: "There is one other method of procuring gold: by making it from orpiment." In regard to electrum, which is listed in Dana's *System of Mineralogy*, under gold, as gold and silver 1 to 1 or 36% silver. According to Pliny when "the proportion is one-fifth the ore is known also by the name of 'electrum'. If the proportion of silver exceeds one-fifth, the metal offers no resistance on the anvil . . . . One peculiar advantage of electrum is its superior brilliancy to silver by lamp-light."

Chrysocolla and Silver

This chrysocolla is not the same substance described under the same name in modern mineralogies. Beckman thinks this substance was azurite (See *History of Invention*, under Cobalt, Vol. I). On the other hand, of later date, Dr. Kenneth C. Bailey has decided this mineral to be malachite. (See *Nature*, Vol. 115, p. 764, 1925). Continuing from Pliny: "The great point of its excellence consists in its producing exactly the tint of corn when in a state of freshest verdure." Here he is referring to its value as a pigment for painting. In regard to silver he begins: "After stating these facts we come to speak of silver ore, the next folly of mankind." He means here the next after gold. "The earth in which it is found is sometimes red, sometimes of an ashy hue. It is impossible, too, to melt it, except in combination with lead or with galena, this last being the name given to the vein of lead that is mostly found running near the veins of silver ore." This galena, he mentions, is not our galena at all, according to Beckman. The latter thinks this galena was a product of smelting. (See *History of Invention*, under Tin-Tinning). The above is a good illustration of the fact that often Pliny does not differentiate between the true mineral and the by-products. However, if one attempts to correct these erors or tries to discover the true name for the substance he describes, that person will benefit by a large increase in the knowledge of mineralogy.

Quicksilver

"There is a mineral also found in these veins of silver, which yields a humor that is always liquid, and is known as 'quicksilver'. All substances float upon the surface of quicksilver, with the exception of gold, this being the only substance that it attracts to itself." He mentions the use of this substance in the gilding of copper with gold leaf.

Minium

The chief source of minium, our cinnabar, in Pliny's day was Spain: "The mine of minium there forming a part of the revenues of the Roman people. Indeed there is nothing guarded with a more constant circumspection; for it is not allowable to

reduce and refine the ore upon the spot, it being brought to Rome in a crude state . . . . " As you will see in the following quotation, quicksilver derived from cinnabar was regarded as a substitute for mercury. "Human industry has also discovered a method of extracting hydrargyros (mercury) from inferior minium." This latter mineral, he says, was used in gilding silver, and, no doubt, the making of mirrors, of which he says: "It is generally supposed among us that it is only the very finest silver that admits of being laminated, and so converted into mirrors. Pure silver was formerly used . . . . but, at the present day, this too has been corrupted by the devices of fraud. But really, it is a very marvelous property that this metal has, of reflecting objects; a property which, it is generally agreed, results from the repercussion of the air, thrown back as it is from the metal upon the eyes.[1] . . . . More recently, a notion has arisen that the object is reflected with greater distinctness, by the application to the back of the mirror of a layer of gold." Immediately this last statement starts another argument for previously he was speaking of a bright sheet of silver or silvered material that was opaque. In that case it would do no good to put gold leaf on the back of this kind of material. In answer to this question, Beckman has decided that whereas glass was first made only a short time before Pliny (by the Romans), and that there is no reference or record of it having been used for that purpose by the Romans or any other people until the 13th century, that Pliny probably referred to a thin sheet of gold, placed at the rear of the mirror to reflect the light on its user.[2]

1 Bailey, Dr. Kenneth, *The Elder Pliny's Chapters on Chemical Subjects*, translates: "Still, the property of producing an image is marvelous and must be due to the reflection of the air which is driven back to meet the eyes."

Book XXXIV

The Ores of Brass

This alloy, the translator says, should really be called bronze but in order to not confuse it with the name bronze used for statuary he uses the word brass. Pliny begins this subject by saying: "We must, in the next place, give an account of the ore of brass, a metal which, in respect to utility, is next in value." In the past the question has been brought up by critics as to whether the ancients were acquainted with the true brass. In response to this question, Beckman states that he has good evidence that the cadmis, referred to later by Pliny, was calamine. This mineral was smelted with copper and thus formed something similar to our present day brass. (See Beckman, *History of Inventions*, Zinc). At the present time it is known that brass was in use by the Romans, at least, at the beginning of the Christian era. (See Thorpe's *Dictionary of Chemistry*).[3]

Copper and Brass (Bronze)

The greater part of this Book XXXIV is a discussion of the various art works in brass. As to copper alone, he has very little to say. He states that the main source of copper was the Isle of Cyprus. In concluding this chapter, the following information by Pliny is quoted, but the

2 Bailey (work cited) says, "Morin-Jean (note on vitrum in Daremberg and Saglio) records that over 500 little mirrors of glass backed with metal (usually lead) have been found throughout the Roman Empire, but most of them seem to date from the third century A.D. or later." In Book XXXVI, Chapter XXVI, Pliny says: "Sidon was once famous for manufacturing glass, and indeed mirrors were first invented there."

3 Bailey (work cited)—"W. Gowland (Journ. Inst. Metals, 1912, VII, 45) comes to the justifiable conclusion that the copper-zinc alloy which we call brass was a Roman discovery."

veracity of his statement is doubtful. When the time came to dedicate some statues in the Temple of Diana at Ephesus, "it was agreed, in order to ascertain which was the best, that it should be left to the judgment of the artists themselves who were then present; upon which it was evident that that was the best, which all the artists agreed in considering as the next best to his own."

Iron and Living Iron

"Next to copper we must give an account to the metal known as iron, at the same time the most useful and the most fatal instrument in the hand of mankind. For by the aid of iron we lay open the ground . . . . plant trees . . . . construct houses . . . . cleave rocks . . . . But it is with iron also that wars, murders, and robberies are effected . . . . not only from hand to hand, but from a distance even, by the aid of missiles and winged weapons, now launched from engines. This last I regard as the most criminal artifice . . devised by human mind; for we have given wings to iron and taught it to fly." In the next chapter he says: "Still, human industry has not failed to employ iron for perpetuating the honours of more civilized life by statues and chased works of iron." Of the metal called "Live Iron" he says: "This is the only metal that acquires the properties of that stone (lodestone), retaining them for a length of time . . . . This mineral is also found in Cantabria (along the north shore of Spain, bordering the Bay of Biscay). I do not know whether this species of ore is proper also for the fusion of glass, as no one has hitherto tried it." Beckman is inclined to believe from this last statement, and also that Pliny has said before that the magnet was employed in making glass, that this "Live Iron" was manganese. Beckman does not, however, explain the magnetic part of Pliny's statement.

Lead

"The nature of lead next comes to be considered. There are two kinds of it, the black and the white. The white is that most valuable; it is called by the Greeks 'cassiteros', and there is a fabulous story told of their going in quest of it to the islands of the Atlantic, and of its being brought in barks made of osiers, (a kind of willow used in making baskets) covered with hides." Of the white lead it may be said that Beckman is certain this metal was tin. In regard to the fabulous story there are these facts: Pliny did not like the Greeks; most of their statements, he ridicules or admits with a sneer. Secondly, possibly the Scilly Isles and positively Cornwall, England, did produce tin. Thirdly, the Celts did migrate long distances in barks with osier sides and laden with tin and lead. (See Traill's *Social England,* the Celts). Pliny's attitude toward the Greeks is duplicated today, for nothing that a democrat does is worthwhile to a republican.[4]

Up to the present point nothing has been said of magic and the uses of all sorts of substances for materia medica. These uses can be regarded as the forerunner of not only medical science, but experimental science as a whole. The time of Pliny is designated as the transition stage between magic and science. For those interested in further study of this subject, consult *A History of Magic and Experimental Science* by Dr. Lynn Thorndike. The following

4 Dr. Bailey (work cited) can find no evidence of the production of tin in the islands off the coast of Moriban or the Scilly Isles. However the latter and Cornwall are generally believed to be the Cassiterides of the ancient Greek navigators and historians.

will illustrate the trend of thought of the ancient in the use of different substances for remedies: "White lead is naturally more dry; while the black, on the contrary, is always moist; consequently the white . . . . is of no use." He must mean here for remedial purposes, because he has already said that "pieces of black lead cannot be soldered without the intervention of white lead." On account of this wet and cooling sensation, bands of black lead were placed about the body to cure internal fevers. "The Emperor Nero . . could not sing to the full pitch of his voice, unless he had a plate of lead upon his chest."

Stannum

"When copper vessels are coated with stannum, they produce a less disagreeable flavour, and the formation of verdigris is prevented; . . . . As already mentioned the finest mirrors were formerly prepared from it at Brundisium, (in S. Italy), until everybody, our maid-servants even, began to use silver ones." This stannum is considered by Beckman to be an alloy very similar to our present pewter;[5] the mention of its use to lessen the disagreeable flavour of the copper brings up an interesting discussion by Beckman in regard to the keen sense of smell of the ancients. He mentions a passage from Plautus, the most celebrated comic poet of Rome, where the "prudent Scapha" gives Philematium a towel "to wipe her fingers lest her lover smell the taint of money" after she had used the mirror. To this Beckman adds that the ancients could determine the fineness of the noble metals by the smell. Today it is a fact that those peoples in the Mediterranean area with the narrow pointed features have a keen sense of smell; those to the south, the negroids, have a blunt sense of smell.

Book XXXV
EARTHS

An Account of Paintings and Colours

"I have given at considerable length an account of the nature of metals—it remains for me to describe the various kinds of earth and stones." Before describing them, in true Pliny fashion, he discusses the economic side of the problem; in other words the uses made of the substances he is going to describe. In this book he discusses paintings and painters, interspersed with the various earths, clays, and such materials as are used for pigments in painting.

Sulphur

"Among the other kinds of earth, (which includes ochres and clays) the one of the most singular nature, perhaps, is sulphur, an agent of great power upon other substances . . When extracted from the mines there (Naples and Campania) it is purified by the agency of fire . . . . There are four kinds of sulphur . . . . 'live' sulphur, known as 'apyron' by the Greeks, and found in solid masses, ... This kind is green and transparent and is the only sulphur used for medicinal purposes." The second kind he calls "glebaceous" sulphur, and was used by fullers. The third, "egula" was used for fumigating wool and bleaching. The fourth kind was used for matches (wood splints dipped in melted sulphur).[6]

Bitumen and Alumen

"Nearly approaching to the nature of sulphur is that of bitumen." He mentions three forms, a slime, an earth, and a liquid bitumen which, no

5 This alloy is called "stagnum" by Dr. Bailey (work cited), who believes it was an alloy of silver and lead.

6 Dr. Bailey (work cited) believes that the fourth kind of sulphur, 'caute', was used mainly for lamp-wicks as opposed to the translation of Bostock and Riley "matches".

doubt, was petroleum. He states that, in Sicily, the inhabitants burned it in their lamps. "Its medicinal properties are similar to sulphur . . . Not less important, or indeed very dissimilar, are the uses that are made of alumen; . . . a sort of brine which exudes from the earth. In Cypress there is a white alumen, and another kind of a darker color . . . The white liquid alumen being employed for dying wool of bright colours, and the black . . . for giving wool a tawny or sombre tint." In the past, the determination of alumen has puzzled the commentators tremendously. For instance, Sir John Hill's explanation of the liquid state seems plausible, he says: "The ancients knew of two kinds of liquid alum, which were no other than the natural solutions of alum in the caverns in the rocks of alum ore . . . . Whoever will visit the places from whence they had them, will find that they are still in being." Of this same mineral Beckman says: "This substance affords a striking instance of how readily one may be deceived in giving names without proper examination. Our alum was certainly not known to the Greeks or the Romans; and what the latter called alumen was vitriol (the green sulphate of iron)." Recently Dr. Bailey determined by experimentation that the substance mentioned by Pliny was probably a combination of the salts of aluminum as well as the salts of iron. (See *Nature,* Vol. 115, May 16, '25, p. 764.)

Book XXXVI

The Natural History of Stones

Introduction

"It now remains to speak of stones, or, in other words the leading folly of the day." He then states how apparently "Everything of which we have previously treated, down to the present book" seems to have "been created for the use of man. But as to the mountains, Nature has made those for herself . . . for keeping together the bowels of the earth; . . . curbing the violence of the rivers by the very hardest of her materials." Yet we hew them down "to gratify our luxurious inclinations." The first part of this book is given to a discussion on marble, its use for buildings; the best sculptors and their work; a very fine discussion for anyone interested in this type of works of art.

The Magnet

"Upon quitting the marbles to pass on to other more remarkable stones, who can for a moment doubt . . . that the magnet will be the first to suggest itself?" Further on he says: "Nature has endowed a stone with both sense and hands." He then tells of five different kinds of magnet that have been described and gives the locations where each kind is found. Then he says: "The leading distinction in magnets is the sex, male and female . . . Those of the female sex are consequently destitute of attractive power." These varieties, no doubt, included non-magnetic magnetite, specular and ordinary haematite and other minerals of iron and manganese. It may not be well understood that the ancients considered those materials that were malleable as metals, and those that broke on the anvil as stones.

The Remaining Stones of Pliny

Only a few of especial interest will be mentioned at this time. "In the vicinity of Munda in Spain . . . . there are stones found, which, when broken asunder, bear the impression of palm leaves." Dr. Bailey is certain that this stone was one of the andalusites, probably chiastolite. (*Nature* Vol. 128, Oct. 1917). Of the next group he says: "At Siphnos, (Greek Archipelago, So. part) there is a stone

which is hollowed and turned on a lathe—a thing, too, that is done with the green stone of Comum in Italy." Beyond a doubt he refers to our mineral talc. He also remarks that this stone is lathed for cooking utensils. "As to specular stone . . . . it admits of being divided with still greater facility (than talc) and can be split into leaves as thin as may be desired." There seems to be little doubt that here he refers to a mica. In explaining this substance in a rock, he says: "It would appear . . . . originally a liquid, which by an animating force power in the earth, becomes congealed like crystals." Silex seems to have been a general name for flint, jasper or quartz and its varieties. "These stones . . . . are subject to no deterioration by lapse of time: moulds, too, are made from them, for the purpose of fusing copper."

Quick-lime, Cement and Gypsum

Before finishing the book, he discusses building materials, including quick-lime and a cement that "surpasses stone in hardness." The last important mineral he discusses in this book is gypsum, which he says: . . . . "has a close affinity with limestone." He concludes this chapter by "one remarkable fact", connected with gypsum, "An intimate friend of the Emperor Augustus, suffering from violent pains in the stomach, swallowed gypsum and so put an end to his existence."

Book XXXVII

The Natural History of Precious Stones

With the remarkable work of the archeologists in ferreting out the past, it is regrettable that they are not more scientific. Time after time they will report the finding of different gold ornaments, gems, and stone implements without seemingly realizing the added information a study of these objects would give. In the case of gold, it has been determined that a lot of the ancient gold came from the Ural mountain area. Of late this fact has been further confirmed by the finding of an ancient mine in Kazakston Province, Russian Central Asia. In this mine were found enough stone implements to employ 250 men. In the same mine were also found two skeletons, one wearing a necklace of glass and clay beads; the implements were a stone hammer and a bronze chisel. The skulls of these skeletons indicated also that these men were foreign to this region. (See *Science*, Vol. 86, July 16, '37).

In the matter of gem materials, as most mineral collectors know, source localities are often denoted by crystal habit, variations in color and other characteristics. Just what material Pliny is trying to describe is often obscure. If we had available a complete list of the gems found, with full descriptions, by comparisons much more information on gems and old sources would be at hand. An illustration of this is the fact that Pliny mentions Egypt as a source of emerald. During the middle ages the opinion became prevalent that the Egyptian source was still farther east. In the early part of the nineteenth century, Monsieur Caillaud rediscovered the emerald mines of Cleopatra, located in Upper Egypt, which were, undoubtedly, the source of the Egyptian emerald of which Pliny speaks.

The First Use of Precious Stones

"That nothing may be wanting to the work which I have undertaken, it still remains for me to speak of precious stones." He relates how many people are satisfied "to have some single gem or other before the eyes, there to behold the supreme and abso-

lute perfection of Nature's work." He finishes this introduction to gems by three tales. The 'fish story' of the Jewel of Polycrates and the tale of the Jewel of Pyrrhus, anotner king, will be omitted here. We will finish this 'prelude', as Pliny calls it, with a part of the tale of Ismenias, the flute player. This gentleman had the gem hobby, and built up a fine collection and liked to display them. Dionysodorus, his rival, not to be outdone, imitated Ismenias, as also did one Nichomachus possess a collection in "great numbers—though selected with little taste. In mentioning these illustrations . . . . it is by no means improbable that they may have the appearance of being addressed to those, who, piquing themselves upon a similar display, because puffed up with vanity which is much more appropriate to a performer on the flute."

The Objects of Luxury

The next three semi-precious minerals, murrhine (fluorspar), crystal, and amber were the popular stones of Pliny's time. The first two were carved into vessels; and amber, "an article which, for the present, however, is in request among women only. All these three hold the same rank, no doubt, as precious stones; crystal, because it is adapted to cool drinks, murrhine vessels, for taking drinks that are either hot or cold. But as for amber, luxury has not been able, as yet, to devise any justification for the use of it."

Murrhine

The way that the Romans were taken by fluorite is very disheartening. They paid fabulous prices for it and got in return a very pretty, vari-colored dish that was all but impossible to drink from on account of its thickness. According to Pliny, this substance came from Parthia (N. E. Persia), although "those of the finest quality come from Carmania, (S. W. Persia). It is thought that these vessels are formed of a moist substance, which underground becomes solidified by heat." He describes the material as translucent, and of many colors, "and the wreathed veins, which, every here and there, present shades of purple gradually changing- to a fiery red-." This description very closely fits that of the Blue John fluorite of Derbyshire, England. In fact several pieces of this material have been found in the ruins of Pompeii, (See *Gemologist,* Vol. V, Aug. & Sept. '35, "Blue John" by Cyril G. E. Bunt).

The Nature of Crystal

"It is a diametrically opposite cause to this (referring to murrhine) that produces crystal (quartz), a substance which assumes a concrete form from excessive congelation. At all events crystal is only to be found in places where the winter snow freezes with the greatest intensity . . a kind of ice . . " After remarking on different theories of its formation, he observes that: "from the circumstances of its being hexagonal and hexahedral, it is not easy to penetrate the substance; and more so as the pyramid terminations do not always have the same appearance. The polish of its faces is so exquisite that no art can possibly equal it." After commenting about the large blocks of crystal he has heard about, he tells of the many defects, such as striations, inclosures and so forth. "But where crystals are entirely free from defect, they are preferred uncut." In line with present day sun cures he says: "I find it stated by medical men that the very

7 Dr. Bailey (work cited) agrees with C. W. King, author of *The Natural History of Gems and Decorative Stones,* 1860-70, that this material was agate. However there are a number of points in favor of the Blue John that both the above authors seemed to have overlooked.

best cautery for the human body is a ball of crystal acted upon by the rays of the sun."

Amber: The Many Falsehoods that have been told about it.

"This is a subject which affords us an excellent opportunity of exposing the falsehoods of the Greeks . . " This is another one of the many allusions he makes against the integrity of the Greeks. One only of these falsehoods will be quoted. "Theomenes says that near the Greater Syrtis (Gulf of Sidra, Africa, bordering on the Mediterrean) are the Gardens of the Hesperides, and Lake Electrum; on the banks, he says, are poplars, from the summits of which amber falls into the water below, where it is gathered by maidens of the Hesperides." Pliny's own explanation for the origin of amber is not far from correct, as: "Amber is produced from a marrow discharged by trees belonging to the pine genus. . . It is a liquid at first . . and is gradually hardened by heat or cold, or else by the action of the sea, . . . " He admits amber has some curative value, as "The female peasantry in the countries beyond the river (north of the Padus River, N. Italy) wearing necklaces of amber, principally as an ornament, no doubt, but on account of its remedial virtues as well; for amber it is generally believed, is good for affections of the tonsillary glands and fauces, the various kinds of water in the vicinity of the Alps being apt to produce disease in the human throat." (goitre).

Adamas

"We will now proceed to speak of the various kinds of precious stones." The order by rarity of precious stones in Pliny's time was diamond, pearl, emerald, with opal coming next in value. Each kind of gem had several varieties based on color. Differences in hardness did not affect the classification. The ancients, of course, knew nothing of the components of the mineral.

"The substance that possesses the greatest value, not only among precious stones, but of all human possessions, is adamas." In the following description, one clearly sees that the information Pliny received about adamas was of legendary origin; also that other glassy white stones were included. "A mineral which was known to kings only, and to very few of them. The name given to a nodosity of gold." Plato (428-348 B.C.) described the diamond as being a kernel in gold, the noblest and purest part of this metal. The ancients "have informed us that it was never larger than a cucumber seed, or differing at all from it in colour. The Indian adamas is found, not in a stratum of gold, but in a substance of a kindred nature to crystal; which it closely resembles in its transparency and its highly polished hexangular and hexahedral form. In shape it is turbinated, running to a point at either extremity, and closely resembling, marvelous to think of, two cones united at the base . . . . These stones are tested on the anvil, and will resist the blow to such an extent, as to make the iron rebound and the very anvil to split asunder." Dieulafait says that this belief "maintained its ground to a very late period."[8] Pliny continues: "Indeed its hardness is beyond all expression, while at the same time it quite sets fire at defiance and is incapable of being heated." Its name, he says, was given to it by the Greeks owing to its "indomitable powers."

In the past it was believed by many

8 *Diamonds and Precious Stones*, 1875, by Dr. Louis Dieulafait.

that the Romans were unfamiliar with diamond either as a gem or an abrasive. In regard to these questions, Dieulafait says that the Romans, at first obtained their diamonds from Ethiopia, but by the time of Pliny's writing they were receiving them from India. Of later date, Dr. G. F. Herbert Smith, in his book, *Gemstones*, says that diamonds were known to Pliny, although very small. In regard to the use of diamond as an abrasive, Beckman says: "Pliny speaks of this in so clear a manner that it cannot be doubted." In chapter 76 of this 37th book of Pliny he says, "In all cases, however, precious stones may be cut by the aid of adamas." It is generally agreed amongst writers on ancient gems, Cyril G. E. Bunt among them, that the Romans knew ruby, sapphire, star sapphire, and emery, although it was not until 1783 that ruby, sapphire and emery were all determined to be corundum. The chrysolite of Pliny is believed to be yellow sapphire; our blue or violet sapphire was one of his hyacinthos stones; and asteria was our star sapphire. Ruby was one of Pliny's red-colored stones, carbunculus.

Pearls

"Next in esteem with us are the pearls of India and Arabia of which we have already spoken in the Ninth Book." This book is devoted to fishes and gives quite an extensive and interesting account of the pearl. As this substance is not strictly a stone, only one of his remarks will be quoted at this time. "Long pearls also have their peculiar value . . . . our ladies quite glory in having these suspended from their fingers, or two or three of them dangling from their ears . . . For after inventing these earrings, they have given them the name of 'crotalia', or castanet pendants, as though quite delighted even with the rattling of the pearls as they knock against each other . . . . "

Smaragdus

"The third rank, for many reasons, has been given to smaragdus." This last word is of Persian origin, zamarrud or zmerud; Greek smaragdos; Latin smaragdus, corrupted by the Spanish to esmeralda, (*Gemologist*, Vol. I, May '32, p. 297, Dr. L. J. Spencer). The word means emerald and not green. At the present day we have the mineral, smaragdite, which is closely allied to actinolite and not emerald. Dr. Spencer says: "Smaragd appears to have been a green corundum." To Pliny, smaragdus included any transparent or translucent material, including glass, that had an emerald color. Cyril Bunt calls Pliny "that mine of quaint information." On account of this quaintness of expression, and his talent of perception and apt comparison, he gives the reader a pleasing and clear picture of the substance he describes. The following description has been quoted by many authors: "Of all the precious stones, this is the only one that feeds the sight without satiating it." When he was speaking of transparent stones, he says: "and the transmitting of the light with facility, they allow the vision to penetrate their interior, a property that is so pleasing also, with reference to water." His next statement has created a great deal of argument: "In form they are mostly concave, so as to reunite the rays of light and the powers of vision; and hence it is that it is so universally agreed among mankind to respect these stones, and to forbid their surface to be engraved." A little farther on he tells of the oft repeated tale of how the near-sighted Nero, "used to view the combats of the gladiators

upon" the flat surface of a smaragdus. This last statement has caused not a little argument amongst the commentators. The thorough Beckman, in his study on the early use of mirrors, has come to the conclusion that Nero used the polished surface of emerald green glass. Of recent time, Dr. Smith explains that the ancients probably used a double cabochon which forms a convex lens with a transparent stone. (See *Gemstones*, Emerald, by Dr. G. F. Herbert Smith).

"Of this stone there are no less than twelve different kinds, ... the finest is the Scythian smaragdus, so called from the country it is found." This country included the area from the Black and Caspian Seas on North, although Pliny's world extended only a little distance north of the Caspian. It is believed, by many, that these green stones came from the Urals, which today are producers of emerald, demantoid garnet, and other green stones. 'Next in esteem to this, as also in locality, is the smaragdus of Bactriana." This country was about where the Uzbeg Republic, Russian Central Asia, is today. He continues: "These stones are collected, it is said, in the fissures of rocks, when the Etesian winds (North Winds) prevail," for at the same time the earth is removed from the rocks. This area is a sandy region whose dunes are encroaching on the western cities of the Uzbeg Republic. His description gives a suggestion that emerald green fluorite might be what he refers to. The third kind and source of smaragdus, he mentions, and last in this discussion was, no doubt, the true emerald from the Cleopatra Mines, Upper Egypt.

Beryl

"It will be only proper, too, seeing the prices of these stones are so exhorbitant, to point out their defects. Some defects, no doubt, are common to all of them, while others, again, like those found in the human race, are peculiar only to those of a certain country . . . Thus . . . . some have a certain density, which impairs their transparency . . . " The last sentence shows that the smaragdus Pliny describes was a transparent or translucent stone of emerald green color. That he actually had emerald in mind when he described smaragdus is substantiated by his comment on beryl, as: "Beryls, it is thought, are of the same nature as the smaragdus, or at least closely analogous." He says further: "The lapidaries cut all beryls of an hexagonal form; because the colour, which by a dull uniformity of surface, is heightened by the reflection resulting from the angles. If they are cut in any other way, these stones have no brilliancy whatever." Pliny did not realize that beryl occurs in hexagonal crystals; it was quite possible that the lapidists did polish the faces as they did after they removed the gum-like skin on the Indian diamonds. "The most esteemed beryls are those which in color resemble the pure green of the sea; the chrysoberyl being next in value, a stone of somewhat paler colour, but approaching a golden tint." The first of these is probably aquamarine, and the second is golden beryl and is not to be confused with the chrysoberyl of the present day. "The people of India are marvelously fond of beryls of an elongated form, and say that these are the only precious stones they prefer wearing without the addition of gold; hence it is that, after piercing them, they string them upon the bristles of the elephant."

Amethystos

"We will now commence with an-

other class of precious stones, those of a purple colour. To the first rank belongs the amethystos of India; a stone which is also found in the part of Arabia that adjoins Syria, . . . in Lesser Armenia, Egypt, and Galatia (Central Turkey) . . . . All these stones are transparent and of an agreeable violet colour, and are easy to engrave." No doubt these stones that he has just described are the purple fluorite. A little farther on, in regard to another variety, he says: "And in a fifth (variety) it borders very closely that of crystal, the purple gradually passing off into white." This last variety is evidently our amethyst.

"The falsehoods of the magicians would persuade us that these stones are preventive of inebriety, and that it is from this that they have derived their name."

Opal

In the arrangement of gemstones by Pliny, opal is placed after beryls, but his description makes this precious stone a fine one with which to conclude this book on precious stones. "Opals are at once very similar to, and very different from, beryls, and only yield to the smaragdus in value . . . . Of all precious stones, it is opal that presents the greater difficulties of description, it displaying at once the piercing fire of carbunculus, (garnet, spinel, ruby, and tourmaline), the purple brilliancy of amethystos (oriental amethyst and amethyst), and the sea green of the smaragdus that is quite incredible." Thus it is that this beautiful gem, the "mocking bird" of the gems, sings out the tonal colors of other precious and semi-precious stones.

It is hoped that this partial review will create an interest in the *Historia Naturalis* so that other more capable writers will, in a way, revise this encyclopaedia so that the valuable information it contains can be available to us. If you were to look up the word "encyclopaedia", under the title, "The Most Ancient Works", you would find the following first line: "The most ancient encyclopaedia extant is Pliny's *Natural History* in 37 books." (Encyclopaedia Britannica, 14th Edition). Prior to Pliny there were other writers on varied subjects, but none of them were nearly so extensive in the number of fields covered. Dr. Lynn Thorndyke, in his book, *A History of Magic and Experimental Science,* says: "Pliny's *Natural History* is perhaps the most important single source extant for the history of ancient civilization. Probably there is no place where an isolated item is more likely to be run down by the investigator, and it is regrettable that exhaustive analytical indices of the work are not available." Another critic, Dr. George Sarton, author of *Introduction to the History of Science,* says: "There is no completed and up-to-date study of Pliny's *Natural History.* Such a study is badly needed."

DO YOU KNOW?

that there is no other magazine in the world that covers the field of mineralogy in so adequate a manner as ROCKS AND MINERALS. It has become a valuable companion to professional and non-professional men and women as

Girl Scouts	Jewelers
Boy Scouts	Doctors
Curators	Miners
Chemists	Lapidaries
Engineers	Lawyers
Business Men	Mineralogists
Contractors	Geologists
	Prospectors

GIFT TO FIELD MUSEUM LIBRARY

A modern man practising an ancient art of prehistoric man was the late Fred Snare, flint-knapper, of Brandon, Suffolk, England. Of historic interest, therefore, is a collection of his correspondence, including orders for work, and letters of praise, from all over the world, which has just been received by the library of Field Museum of Natural History, as a gift from Dr. Henry Field, of Chicago. In the laboratories of the department of anthropology at the Museum is a collection of Snare's flint-knapping tools, together with samples of his work.

"As a craftsman, Snare was unsurpassed," stated Dr. Field today. "He alone was able to make small flint rings. He was the last of a family line of flint-knappers which dates back at least to the year 1066, for in Domesday Book one of his direct ancestors was ordered by William the Conqueror to repair a flint church wall in Kent. Up to the time of his death Snare was engaged in filling orders for gun flints from all parts of Africa."

Dr. Field made Snare's acquaintance while conducting the Museum's archaeological expeditions to Stone Age sites in Europe. At his death, Snare willed his correspondence to Dr. Field.

Value of Mineral Products of The United States, 1936-1937, by States—Summary[1]

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Mines
JOHN W. FINCH, Director

State	1936	1937	State	1936	1937
Alabama	$44,752,688	$53,518,993	Montana	65,569,150	82,086,815
Alaska	23,737,714	27,927,958	Nebraska	3,843,562	4,837,809
Arizona	60,532,996	94,564,494	Nevada	32,693,129	38,871,816
Arkansas	21,296,783	25,578,393	New Hampshire	1,182,055	1,219,869
California	437,565,809	476,974,925	New Jersey	24,421,046	31,467,931
Colorado	56,214,827	67,338,548	New Mexico	45,942,006	72,855,745
Connecticut	3,317,494	3,689,554	New York	71,647,775	77,665,874
Delaware	444,093	397,362	North Carolina	9,955,519	11,160,444
Dist. of Columbia	547,576	522,687	North Dakota	2,902,453	2,873,011
Florida	12,973,243	13,811,958	Ohio	122,684,043	131,025,104
Georgia	11,756,592	12,584,060	Oklahoma	305,191,649	367,444,222
Idaho	29,965,964	40,633,119	Oregon	7,080,975	6,609,710
Illinois	117,916,128	133,437,554	Pennsylvania	599,457,486	599,817,364
Indiana	52,281,539	54,886,756	Rhode Island	929,103	862,710
Iowa	28,359,140	26,941,350	South Carolina	3,432,662	4,022,325
Kansas	121,689,562	154,376,403	South Dakota	23,221,620	23,472,873
Kentucky	113,435,307	127,423,680	Tennessee	31,121,865	34,893,847
Louisiana	153,358,397	182,118,905	Texas	638,643,488	813,270,605
Maine	3,423,353	4,129,391	Utah	61,209,302	105,652,422
Maryland	11,157,550	10,634,854	Vermont	6,225,396	7,042,547
Massachusetts	7,559,253	7,813,345	Virginia	37,295,168	46,019,085
Michigan	100,646,492	119,167,573	Washington	22,921,456	26,658,257
Minnesota	94,568,991	152,107,070	West Virginia	271,501,941	306,660,947
Mississippi	3,846,104	4,821,950	Wisconsin	13,277,983	15,228,024
Missouri	41,350,860	52,446,272	Wyoming	34,498,261	41,087,908

1 In this table iron ore, not pig iron, is taken as the basis of valuation of iron, and in the case of other metals mine production (recoverable content of metals) is the basis.

By M. B. Clark,
Mineral Production and Economics Division,
H. H. Hughes, Acting Chief Economist.

A TRIP TO GOUVERNEUR, N. Y.

By FRANK P. ATKINS, JR.

One of the most interesting collecting and geological trips which I have taken was with a geology class of Cornell University (Ithaca, N. Y.) in the spring of 1937. The class was one devoted to economic geology that was given by Dr. Ries. The object of the trip was to visit the talc and zinc localities of St. Lawrence County. This county is located at the western edge of the Adirondack Mountains in north-western New York.

About fifteen of us left Ithaca, N. Y. in the early morning driving in a northeastward direction following route 13. The first observation of geologic interest was a kame just outside Ithaca. This glacial phenomenon exhibited a remarkable array of similar sized, almost perfectly rounded boulders; the boulders were, of course, hard rocks, mostly quartzes and granites. Before arriving at Cortland we noticed a glacial outwash plain which extended for some distance on each side of the road. The fields covered with small rounded rocks served as their final resting place after they had been carried by the glacier and then transported from the ice mass by streams originating from the melting ice.

At Cortland we took route 11 and headed straight for Syracuse. Before coming into the outskirts of the city we descended from the well known Helderberg escarpment which runs as far west as Lockport. From Syracuse we continued on 11 to Watertown. We had not travelled very far before a definite change in the character of the land surface was discernible; we were approaching the metamorphosed area surrounding the base of the Adirondacks. An interesting feature was the fine roche moutonnée fect. Most of the exposed metamorphics were distinctly shaped by the glacier, their smooth sides facing the direction from which the ice came, and their rough and steep sides facing in the opposite direction. About fifty miles south of Gouverneur we noticed the beginning of the Grenville series of metamorphosed sediments. The Grenville series is one of the oldest Laurentian rocks of North America, and the oldest known series exposed in New York State. These rocks consist of quartzose gneisses and quartzites with great beds of dolomite and limestone. In the limestone we could easily distinguish the small disseminated flakes of graphite. Incidentally the origin of this graphite has been a topic of wide controversy; now, however, it is generally thought to have been derived from organic matter in the sediments.

We arrived at Gouverneur in time for lunch after which we started for Talcville. This section is New York's most important supply of talc. In fact the region around Gouverneur provides the source for a great part of the talc mined in the United States. All the talc formations are in rocks of the pre-cambrian age. The district extends from Sylvia lake in the southeast to a little beyond the village of Edwards, a distance of approximately twelve miles. The width is from one-half to two miles. Talc was first shipped from the Gouverneur district about sixty years ago, and has been produced fairly regularly up to the present time. Now the mining is carried on by the International Pulp Co. and the W. H. Loomis Talc Corp. The advantage of Gouverneur talc is

its whiteness, and for this reason the talc deposits of the Edwards-Sylvia Lake district are considered among the most important deposits in the world for making powered talc.

We went down into one mine and examined the formation. The talc is obtained from crystalline limestone which cuts through the pre-cambrian gneisses. It is a result of alteration of enstatite and tremolite, the latter two minerals having locally replaced the limestone. Besides good talc specimens we found hexagonite fairly abundant and also fine fiber like crystals of tremolite. Walking through the mine did not prove too advantageous in obtaining specimens for one could see little more than the continuous talc tunnel sides; also any other minerals present were concealed for the white talc dust covered everything. This talc is used for the filling of paper, in the rubber industry, and it is especially suitable for mixed paints because of its purity.

After visiting the talc mine we stopped at a feldspar quarry which had been out of operation for some time. It was owned by the Green Hill Mining Co. I understand that the feldspar it produced was of good quality but had one drawback in the high percentage of silica present. The feldspar is white microcline intergrown to some extent with albite. Some crystals as large as three feet in length have been found. After picking around in the dumps, crystals of apatite, titanite, and tremolite were found. Clear-cut crystals of tremolite about one-half inch wide and two inches long were found imbedded in quartz. The titanite occurred as small wedge-shaped crystals. Inferior specimens of mica and pyrite were also present. A considerable number of minerals have been identified at this quarry, but in our limited time we did not have the opportunity to find much variety.

We returned to Gouverneur where we spent the night. The next morning we visited the most important feature of the trip. This was Edwards where a large zinc mine owned by the St. Joseph Lead Co. is located. The ore occurs in the Grenville limestones, the body being an irregular steeply dipping lens. Besides sphalerite and pyrite, sometimes galena is found. The gangue minerals are chiefly pyroxene, serpentine, and tremolite.

At the mine office we were given miner's lamps in preparation for going into the mine. They had drilled down as far as 1700 ft., but had not yet mined below the 1500 foot level. We descended in the mine elevator getting off at the 1500 foot mark. After following one of the tunnels for some time we came to a big stope which went down at a rather steep angle. At the bottom of the stope was an opening covering a deeper cut across which opening was a grill called a grizzly by the miners. We crawled or rather slid down to the grizzly and then descended a nearby ladder which led to the lowest level. On examining a few recently drilled caves or cavities an interesting occurrence of halite was found. The salt occurred as small veinlets in the sphalerite. The veinlets were not more than an eight of an inch thick and only had been found at this place in the mine. The occurrence of the pyrite was also interesting. Pyrite crystals or crystal clusters from one-eighth of an inch to three-quarters of an inch or more in diameter were dispersed almost evenly through some sections of the sphalerite. As for the sphalerite, it was for the most part in a massive

form. I couldn't find any sizable crystals and as far as I know nothing there approaches the tri-state specimens.

We spent the entire morning in the mine, and in the early afternoon stopped at a marble quarry located on the outskirts of town (Gouverneur). Although they were not quarrying the stone, there was some cutting being done. The stone used was a moderately coarse-grained, grayish white dolomitic marble. The marble is too coarse for fine work; thus it is used chiefly for ordinary structural work and for inscriptional purposes.

On our return trip those in my car decided to drive through the Drumlin country which is west of the Syracuse area. For those who may be unfamiliar with Drumlins I will describe them briefly. They are hills of glacial till varying from one hundred feet to a mile or more in length found in clusters and arranged in a staggered formation. The thick and steep end of the Drumlin faces north. Many theories have been advanced to explain their origin. The most widely accepted one is that they represent a stagnant stage phenomenon of the glacier, masses of till being forced to ridge up by the overlying ice. From the Drumlin country we traveled west to Auburn and then returned to Ithaca via route 90 which follows Cayuga Lake, one of the most scenic of the Finger Lakes and also highly interesting because it exhibits so many glacial features.

A WEIRD EXPERIENCE

By PETER ZODAC

Editor, ROCKS AND MINERALS

One of the strangest collecting experiences I ever had was at the old abandoned magnetite mine on top of Bull Hill, near Monroe, N. Y. I had been lured to the locality by Mr. Egbert McElroy of Monroe, a member of the Rocks and Minerals Association. Prior to my visit to the locality, Wed., July 29, 1936, we had never met but now we are very good friends. For some time Mr. McElroy had been trying to have me visit him but without success. In some manner he must have stumbled upon a weak spot in my constitution because when a letter arrived from him July 28th, stating that a good deposit of lodestone was in his vicinity, I was over to see him the very next day.

There is something about lodestone that attracts me—perhaps its the iron in my blood—and I have traveled many miles to visit its occurrences. But not one intrigued me so much as did the deposit in the Bull mine. I have read all printed literature available on this mineral and my conclusions were that lodestone was found only as loose pieces on the surface of the ground. But the Bull Mine occurrence was a deposit actually in the ore. No wonder I rushed over to examine it.

I could not believe that the massive clean looking magnetite was lodestone when first seen. So I threw my hammer against it and—it froze to the wall. It *was* lodestone.

Then we spent 1½ hours in the strangest experience I ever had. To this day it has me baffled. We hammered and hammered and hammered on the smooth wall and after about 90 minutes of work all we could show for our efforts were a number of small fragments and tiny chips. Not one

decent specimen was among them and what was worse still there was practically no magnetism left in the pieces. But oh—such labor! I never worked so hard or tired more easily than in trying to get specimens of the lodestone. Before 10 minutes went by I was mysteriously exhausted and panting for breath. It could not have been the high altitude as the mountain is only 740 feet high above sea level. It could not have been lack of air as we were close to a large opening with lots of fresh air. It could not have been due to heat as it was nice and cool underground. Nor could it have been due to cramping from lack of room, as I was standing at ease. What then was the strange *something* which tired me so easily? It gradually dawned upon me that in hammering the chisel against the lodestone, the chisel became magnetized and in turn it magnetized the hammer. Consequently when hammer hit chisel they stuck together and it required some effort to break them apart. Therefore it was necessary to work real fast to break contact (which I had been doing without realizing it) and this was an exhaustive operation. There was some consolation, however, which we soon afterwards discovered and that was—there was no danger in hitting your fingers—the chisel would always attract the hammer. It was a novel experience, therefore, to pound away in the semi-darkness (at times I actually had my eyes shut) and always hit the chisel on the head!

Another matter which made the work a most laborious one was that the chisel would penetrate the lodestone but slightly because the broken up material could not be removed from the hole. Some would attach itself to the chisel and thus be removed with the fingers but most of it would remain in the hole—being attracted by its parent mass—so that there was always a cushion of magnetite "sand" around the chisel. This slowed up operations considerably.

There was still another and a very annoying experience that occurred quite frequently. After pounding away for some minutes, the fingers of my left hand, holding the chisel, would become slightly numbed and loosen their hold. Then on drawing back quickly the hammer arm, the chisel, attracted to the hammer, would also be drawn out, and as the arm snapped back the chisel would go flying over my shoulder to fall in the workings below. We had no flashlight with us so that I was forced to turn around quickly after each occurrence and jump after it, oftentimes not knowing where I was jumping.

I never worked so hard nor got so little for my efforts before or since my visit to the Bull Mine lodestone occurrence. Many boulders, some very, very tough, have I pounded at various localities, but always with some result. But the lodestone occurrence was the toughest of them all and what was worse still, there was, as has been said, practically no magnetism left in the specimens that we chipped off.

Although Mr. McElroy had induced me to visit the Bull Mine lodestone occurrence, I went there so quickly after the arrival of his letter as to give him no opportunity to adjust his business so that he could accompany me. A friend of his, Mr. Stanley Lybolt, also of Monroe, guided me to the locality. Will both gentlemen please except my grateful thanks for this novel experience?

Buy more minerals.

. . Collectors' Tales . .

By PETER ZODAC

AN EMBARRESSING MOMENT

One evening, some years ago, I was assisting a science teacher who was conducting a class in nature study in a small village in New York State. Naturally my talk was devoted to minerals, illustrated with specimens brought for the occasion. Some of the group, knowing I was to be present, had brought with them a number of specimens for identification. There was one of which its owner was very proud but as a matter of fact was of a type that a real collector would not look at twice—just a large drab-looking rock with a tiny fossil embedded in it. Nevertheless this rock was passed around the class as it if were a specimen of great importance.

After the lecture was over and we had proceeded to pack up, this large rock was suddenly missed and its owner became greatly agitated. We looked high and low for it, in desks, closets, boxes, on the floor, under the radiator, but without result. The rock could not be found. It was uncanny how that large mass could have disappeared from that small room and many of us glanced at each other with a guilty look as if each was responsible. The mysterious part of it all to me was not how the rock disappeared but who in the world would be so crazy as to take it.

The owner was so heart-broken over his loss that I gave him five or six specimens of mine any one of which was easily worth many times his rock. He seemed to appreciate the gift but still to him his loss was tragic. Just as we were about to leave the room, as we were all packed, I grabbed my hat off the arm of a chair, when to my amazement and deep embarrassment, the missing rock laid before me. Was my face red! Every one was relieved, however, that the missing rock was found and the owner of course overjoyed who wanted to return to me my specimens but which were not accepted. On the way home, my friends began to razz me for trying to "steal" the poor fellow's valuable specimen.

For some time I was greatly mystified as to how the large rock could have gotten under my hat (size 7½). The only explanation possible is that during the course of my talk I happened to lay the hat on the arm of the chair, it settled snugly over the rock which was lying on it, and in the course of our extensive search no one thought of lifting the hat—perhaps the only movable object in the room that was not touched.

The best minerals in the world are advertised in ROCKS AND MINERALS. The most gorgeous gems are carried in stock by dealers who advertise in ROCKS AND MINERALS. The latest books on mineralogy, lapidary equipment and fluorescent lamps are advertised in ROCKS AND MINERALS. It pays to buy of advertisers in ROCKS AND MINERALS.

OUR FIRST CONVENTION

The first general convention of the Rocks and Minerals Association, held Sat., June 17th, 1939, in the Ford Auditorium of the Peekskill Military Academy, Peekskill, N. Y., in the opinion of everyone present, was a splendid success. Members of the Association from various states were present, some coming in groups, and many inquiries were made as to whether this would not be an annual affair. The addresses were intensely interesting and most of them illustrated with colored slides. At no convention were there ever more dealers present nor so handsome a display of minerals from their stocks. The day was perfect. Luncheon at the Bonnie Brook Inn, on the outskirts of Peekskill, was well served in an hour of pleasant sociability among those of the various tables. No one went away without the happiest memories of the most delightful, interesting and sociable gathering he had ever attended. Perhaps no more representative gathering of members of the Association could have been had.

The gymnasium of the Ford Building, which was set aside for the dealers, was handsomely decorated so that it presented a most attractive appearance. The dealers' exhibits were quite a serious rival to the convention as we had great difficulty in dragging the members away from the attractive display-tables and the program as a result late in starting. Had it not been for the exceedingly interesting addresses and the very fine slides illustrating them, many of which were colored, the dealers might have run away with the convention. But once the speakers began their addresses, even the dealers joined the audience.

Dr. Alfred C. Hawkins, of the U. S. Department of Agriculture, and author of *The Book of Minerals,* was the first speaker whose subject was "Mineral collecting in the Southern States", illustrated by a number of fine slides. His talk was intensely interesting and many members made notes of some of the localities mentioned. He stated, for example, that he saw little farm houses in Georgia, around the base of whose outer walls, good loose staurolite crystals had been used for filling. As O. Ivan Lee (the "Titanite King") was present, Dr. Hawkins mentioned, for his benefit, Stone Mountain, Ga., as a new locality for titanite. (Mr. Lee, however, did not immediately leave the convention.)

Mr. James G. Manchester, author of *The Minerals of New York City and Its Environs,* was the next speaker whose subject was "The Chalcedony Pseudomorphs of Florida", illustrated by colored slides. Not only did Mr. Manchester show some excellent slides of intensely interesting specimens—one of which had a petrified worm in its center—but all specimens were actually on exhibition in the gymnasium and the audience was invited to view them. Mr. Manchester's fine talk gave much information on the locality for the specimens and how the specimens were collected, cleaned, and opened. He stated, for example, that Tampa Bay is not the locality for the pseudomorphs, as so popularly supposed, but Hillsborough Bay, which is an indentation of Tampa Bay.

Dr. Frederick H. Pough, of the American Museum of Natural History, New York City, was the last speaker

for the morning session. His colored slides of gem minerals and crystals were outstanding for brillance and distinctness and were admired by all. They were the new Kodachrome type which is believed may soon replace the larger and more costlier hand-painted slides. The first part of Dr. Pough's address was devoted to the cutting of the Jonker diamond and his remarkably fine series of slides covering the various steps made was an educational feature of great value. Dr. Pough had another series of fine colored slides which he would have shown had it not been for the delay in opening the morning session.

Prof. B. M. Shaub, of Smith's College, Northampton, Mass., started the afternoon session with another series of remarkably fine colored slides of gorgeous minerals. A feature of his talk was that part devoted to the taking of colored photographs of minerals and this too was illustrated by slides showing the various steps necessary that have to be made. One of his slides was an exceptionally fine photograph of Stephen Varni's opal in which Prof. Shaub had succeeded in securing much of the red fire the opal contains, which Mr. Varni was then wearing in his tie.

Mr. W. Bryant Mather, Jr., of the Field Museum of Natural History, Chicago, Ill., was the last speaker. His talk covered minerals and mineral localities of Maryland (his native state). So convincingly and enthusiastically did he speak of the minerals of Maryland and their localities that that state will be a mecca for mineral collectors for some time to come. Baltimore, Texas, Soldier's Delight, Bare Hills, Reistertown, Blue Mount are not just places in Maryland but also some of the localities where good minerals may still be collected. Mr. Mather's very fine talk was a fitting close to a very successful Rocks and Minerals Association Convention.

Mr. H. Alban Anderson, of Peekskill, N. Y., was Chairman of the Convention, taking charge of the program, welcoming the members on behalf of the Rocks and Minerals Association, and introducing the speakers.

It needed only a glance in the gymnasium to understand why the dealers' exhibits had proved to be so attractive as to delay the opening of the morning session of the Convention. The exhibition tables of 7 mineral dealers and 3 collectors were arranged along the four sides of the large and spacious gymnasium. The dealers exhibiting were:

Ehrmann, Martin L., of New York City. A magnificent assortment of fine specimens from his large stock, most of them from the Calvert Collection.

Schortmann's Minerals, Easthampton, Mass. A gorgeous assortment of spectacular minerals, prominent among them being crystallized selenites from Nevada and crystallized vanadinites from Arizona.

Smith, Jay, of Chester, N. Y. A very fine assortment of minerals, mineral sets, books, etc., for beginners. This feature is often overlooked at conventions.

Smith, Peter, of Highland Mills, N. Y. A splendid assortment of Montana minerals only. We never saw so many specimens of this western state before. The specimens were all choice and judging by their number one would think that the entire state of Montana had been moved to Peekskill.

Van Esselstyn, Richard H., of New York City. Emeralds, emeralds, nothing but emeralds! Never before did collectors see so many specimens of

this green gem exhibited at a Convention.

Varni, Stephen, of New York City. He had the largest display of fine gem stones, jewelry, mineral specimens and a Gilde Lapidary Machine which was operated for the benefit of those who wished to see its manipulations.

Ward's Natural Science Est., Inc., of Rochester, N. Y. The world's largest mineral dealers proved it by their splendid exhibit of fine specimens of various types and from various localities. Mr. Robert C. Vance was in charge.

The three collectors exhibiting were:

Hawkins, Dr. Alfred C., of New Brunswick, N. J. He had a table covered with lustrous, sparkling pyrite, from New Jersey, that attracted much attention.

Manchester, James G., of Hampton Bays, L. I., N. Y. Displayed a very fine selected series of chalcedony pseudomorphs which he had personally collected at Hillsborough Bay, Fla. Most of the specimens were polished, bringing out the remarkable coloring and the most striking perhaps being those exhibiting black onyx.

Marshall, E. M., of Bethel, Conn. A beautiful assortment of opals were displayed which Mr. Marshall personally collected in Mexico during his six months tour of that country and from which he had recently returned.

It was most gratifying to note that all the Convention speakers, including the Chairman, were members of the Association, and all dealers, excepting one.

The funds in the hands of the Treasurer proved just sufficient to pay the expenses of the Convention. We still have a balance of $1.05 in the bank.

PETER ZODAC, *Secretary*

Rocks and Minerals Association.

JUNE WEDDINGS

Miss Doris Gertrude, daughter of Mr. and Mrs. Thomas Settle, was married to Mr. Eugene W. Blank on Sat., the 17th of June, 1939, at Philadelphia, Penn., and Miss Viola Gregory and Mr. Hatfield Goudey, were married in Goldfield, Nev., on the 4th day of June, 1939, at the bride's home. To the happy grooms, both of whom are members of the Rocks and Minerals Association, we extend our best wishes and hope for them long and happy lives with their love for minerals unabated.

Mr. Blank is connected with the Colgate-Palmolive-Peet Co., of Jersey City, N. J., and has contributed many fine articles to ROCKS AND MINERALS. Mr. Goudey is geologist for the Harvard Mine at Jamestown, Calif., where he and Mrs. Goudey have taken up their residence.

WITH OUR MEMBERS

Hugh Montgomery, a young member from Windsor Locks, Conn., has been doing some missionary work for the Association. He has encouraged a friend, Roger Colton, also of Windsor Locks, to read his copies of ROCKS AND MINERALS. Result—young Colton is now a member, too.

Warder H. Cadbury, of Belmont, Mass., is spending his summer vacation at Back Log Camp, Sabael, N. Y. He made a bicycle trip from his home to the camp through New Hampshire and Vermont and visited a number of mineral localities en route.

James C. Fisher, of New Rochelle, N. Y., has opened up his summer camp for boys, Camp Marquette, at Lake Spofford, N. H. The camp is near the famous Westmoreland fluorite locality to which Mr. Fisher makes frequent visits.

E. M. Marshall, of Bethel, Conn., returned from a six months tour of Mexico with a large number of fine opals, many photos, and a host of interesting stories. So fascinating are his stories, that a few weeks ago when he visited Pres. R. Emmet Doherty's home, in Peekskill, N. Y., he was kept telling them until 2:30 a. m. As a narrator of interesting stories, Mr. Marshall is without an equal.

S. C. Edwards, of Colton, Calif., was a recent visitor to the offices of Rocks and Minerals Association. His accounts of western minerals and their localities were so interesting that he was induced to spend two days in Peekskill so that we could hear more of them.

Miss Dorothy Jackson, of Elyria, Ohio, is another member who has fallen to the lure of the mineral localities around Spruce Pine, N. C. A card mailed from there informs us that she is all set and ready to do some collecting.

Capt. and Mrs. H. E. Mitchell, of Long Beach, Calif., were two other visitors to the offices of the Association. Unfortunately they could stay no longer than 10 minutes so that we could not take them out to some of the localities around Peekskill.

C. A. Weeks, of Meredith, N. H., has one of the finest collections of New Hampshire minerals in the State.

Ralph J. Magri, Jr., of Lynchburg, Va., is now attending Tri-State College, at Angola, Ind. Not many minerals are known from this area but we are very sure if any occur that young Magri will find them.

One of the finest mineral collections in the East is that belonging to Walter P. Sachs, of Caldwell, N. J. There are hundreds of fine choice specimens, each of the same size in his general collection, which are attractively displayed in specially-built glass wall cabinets. As for his New Jersey series of minerals, many are marvelous specimens. His suite of specimens from the famous old Francisco quarry (now abandoned), of Great Notch, N. J., is beyond doubt the finest in existance. All in all, his collection is worth going miles to see.

Wilbur J. Elwell, of Danbury, Conn., is on a western tour. He was last heard from Cleveland, Ohio.

Miss Janet Bradley, of Hartford, Conn., is spending her summer vacation at East Jaffrey, N. H. This state is very popular as a vacation center for many of our members, judging from the large number of requests to have the July and August issues of ROCKS AND MINERALS sent there.

C. N. Joyner, formerly of Tientsin, China, is back again in the United States and is residing at Gulfport, Miss.

Before the summer is over we may hear that a number of interesting minerals have been found around Sussex, N. J. Reason —Miss Evelyn Waite, of Crestwood, N. Y., will be there until Aug. 31st.

Ancram, N. Y., is a locality noted for old mines and interesting minerals. But Miss Violet Miller, pretty young school teacher from Brooklyn, N Y., who has been spending her vacation there for the past few years, is always silent about what she has collected. Can any of the members persuade her to announce what she may find this year?

H. W. Slocum, of Rochester, N. H., but whose duties as an Inspector for the U. S. Government takes him to many parts of the country, has recently been ordered to Rock Hill, S. C. In a letter from there he writes: "I shall do very little mineral collecting in summer in this part of the country as it is entirely too hot. The only thing I am hunting now is a cool breeze. Found one this week end at Myrtle Beach, S. C., 200 miles away. But 200 miles for a swim!!!"

William Hutton, Jr., of Green River, Wyo., has a fireplace in his home which is of more than passing interest as it is built of minerals, fossils, and Indian relics. So desirous was Mr. Hutton that only the best materials should go into the construction of the fireplace that he had spent 20 years in their selection. The result now is that the fireplace is the center of interest for miles around and people from all over the world have made special visits to Green River to see it.

BIBLIOGRAPHICAL NOTES

Rocas y Minerales de la Republica Dominicana. By Dr. Willy Lengweiler. The author has contributed a number of interesting articles on the minerals of the Dominican Republic to ROCKS AND MINERALS which prove that that little West Indian republic has much to offer the mineral collector. In his preface to the report here reviewed, Dr. Lengweiler says: "During the able administration of His Excellency the Generalissimo Dr. Rafael Leonidas Trujillo Molina, the Benefactor, the order was issued to prepare "Rocks and Minerals of the Dominican Republic" in order to demonstrate to the world that the Dominican Republic, besides being principally an agricultural country, contains also a considerable wealth of metals and minerals. . . . While the Dominican Republic is practically an unexplored country, not only is it rich in gold but also in iron, copper, manganese, hydrocarbons, marbles, and alabasters and there are very great opportunities for enterprise to expose and develop these vast sources of wealth."

A valuable booklet on the minerals of the Dominican Republic. Spanish and English Text—(Spanish pp. 1-53; English pp. 59-91); 6 maps, 10 photos, 1 figure, 91 pp., 1939.

Copies of the booklet may be obtained through Dr. Willy Lengweiler, Geologist, Box 1212, Trujillo City, Dominican Republic, West Indies. Price is not quoted so copies may be free.

Geologic Features of Recent Engineering Projects in New York City: By Thomas W. Fluhr, M. M. E., N. Y. In this 18 page paper, Mr. Fluhr discusses the part that geology has played in the planning and construction of several large engineering projects in the vicinity of New York City. Some of these have been completed; some are now in process of construction; and one, at least, has not yet been begun.

The engineering projects discussed are: The Triborough Bridge; The Whitestone Bridge; The Wards Island Sewer Tunnels; The Lincoln Tunnel; The Queens Midtown Tunnel; and The Proposed Battery—Hamilton Avenue Tunnel.

Six sketch maps add much of interest to this valuable paper which appears in the first quarterly issue of 1939 of *The Municipal Engineers Journal* (29 W. 39th St., New York City, price 50c), pp. 23-41.

On Identifying Minerals with the Aid of the Spectrograph: By O. Ivan Lee and Thomas A Wright, both of Lucius Pitkin, Inc., New York City.

Our readers may recall the very fine article "Use of the Spectrograph in Mineralogy" by Mr. Wright which appeared in the April, 1938, issue of ROCKS AND MINERALS. The present paper is another valuable contribution on this new method of identifying minerals. Reprinted from the *Proceedings of the Sixth Summer Conference on Spectroscopy and Its Application.* Massachusetts Institute of Technology, Cambridge, Mass. (1939).

Minerals Catalog: A 10 page catalog listing a number of mineral specimens which occur in eastern California, Western Nevada and Arizona. Issued May, 1939, by the Inyo Mining Laboratory, Box 52, Independence, Calif.

The money spent for the purchase of a good specimen is a good investment.

CLUB AND SOCIETY NOTES

The Chiselers

The Chiselers, a group of young girls residing at Crestwood, N. Y., held their second annual exhibit on Wed., June 7, 1939. The young lassies, who average 11 years of age, are intensely interested in minerals and their exhibit held in the Community House of the Asbury Methodist Church, Crestwood, was a most inspiring one which created considerable interest and discussion. It attracted a large number of visitors who marveled at the large array of beautiful specimens which were neatly arranged and all nicely labeled.

June Blanchard won first prize for the best specimen found by an exhibitor. Jane Lind and Edith Larson won second and third prizes, respectively.

Twenty-one gem stones mentioned in the bible, with their biblical as well as modern names, won first prize for Ruth Otto. Jane Lind won second prize for her display of minerals used in the home, and Edith Larson received third prize for her exhibit of minerals used in the telephone.

A first and second prize went to June Blanchard and Eleanor Rao, respectively, for their entries in the best homemade box collection class, while Ruth Strauss won first prize and Eleanor Rao another second prize in their exhibits of the best one-mineral collection.

Winners of the popular vote (cast by visitors) were June Lind, Eleanor Rao, and Ruth Otto.

Peter Zodac, Editor of ROCKS AND MINERALS, was the judge of the Contest.

Bay State Mineralogical Associati

The first field trip of the Bay State Mineralogical Association, of Boston, Mass., was held at Grafton, N. H., Sun., June 11th, 1939. The Glass Hill quarry was the locality visited and thanks are due Mr. Verplanck, the Superintendent, for allowing us to collect there. The members had no sooner started collecting when Bill Quinn and others struck a "gold mine" for greenish autunite which we found later to fluoresce a bright green even under an argon bulb. It occurred as a powdery coating on feldspar. Meanwhile, Don Mailloux and Warder Cadbury had explored a deep pit with ice and snow and ran across a large crystal of beryl embedded in rock. The crystal was approximately 3 feet in length and 1½ feet in width. Other minerals found here were:

Montmorillonite, in pinkish masses.

Gummite, in small bright orange masses (not very common).

Uraninite, both massive and as dendrites.

Tourmaline, black, massive and as inclusions in muscovite.

Quartz, milky and smoky.

Muscovite, in large plates.

Apatite, massive.

We left the quarry at 3:00 p. m. as they were preparing to fire a blast. As we still had a few hours of daylight, we headed for Wilmot, N. H., where we visited a garnet mine, after receiving permission from its owner. At the summit of a short but steep hill we found the old pit filled with water. It was about 40 feet in diameter and very deep. The garnet occurs as rough crystals in matrix. The day being quite warm and the sight of the cool water so tempting, that most of the group went in swimming. By the time we finished our swim, it was time for us to go home. So we spread out all the specimens that had been collected and divided them up between us. This done, we got into the cars and headed homeward after a very enjoyable day of collecting.

The club wishes to acknowledge its thanks to Mr. Frary of Newton and to Mr. White of Wellesley Hills who kindly offered the use of their cars for the trip.

WARDER CADBURY, *Secretary.*

Rhode Island Group Holds Field Trip

The mineral collectors of Rhode Island liked the annual field trips so well, which the Rocks and Minerals Association started, that they decided to hold one this year even though the Association was not sponsoring it. Our largest crowd, twenty-five, braved the usual rain, Sun., June 4th, and visited some of the old localities of Massachusetts. Our main visit was to Bolton. This famous old limestone locality has been re-opened and the collecting is good. Scapolite and boltonite are abundant and most of the other minerals listed for this locality can be found with a diligent search. We also visited the chiastolite locality in Lancaster and the tourmaline locality at Fitchburg.

ALONZO QUINN.
Director for Rhode Island.